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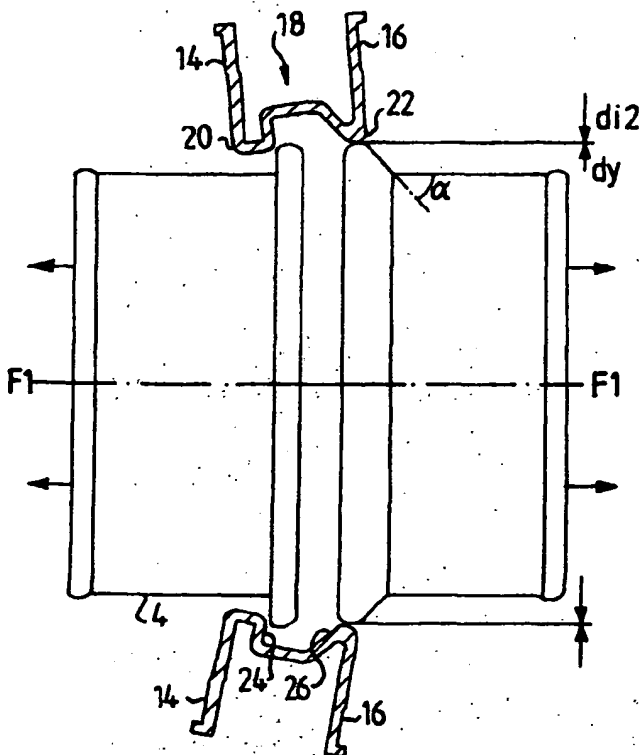
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ning of each regular issue of the PCT Gazette.

(54) Title: SAFETY COUPLING



(57) Abstract: The invention relates to a safety coupling (2) for a flexible line, designed as a tubular, two-part flange joining with a first coupling half (4) with straight flange (10) and a second coupling half (6) with conical flange (11). The coupling halves are joined together via the flanges by means of a resilient locking ring (8) which has a shape with coupling members (20, 22) matching the flange parts of the coupling members (20, 22) matching the flange parts of the coupling halves. The locking ring (8) has segments (12) which are movable relative to one another and which, by means of a spring arrangement (32), are resiliently prestressed (32) to a first position in which the coupling members (20, 22) straddle the flanges (10, 11). The flanges are separable by means of the fact that the segments (12) of the locking ring can be displaced by a wedge effect counter to the prestressing force (f) to a second position in which the surrounding internal diameter (di) of the locking ring (8) corresponds to the external diameter (dy) of the conical flange and the coupling (2) divides.

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Safety coupling

The invention relates to a safety coupling according to the preamble of patent claim 1 and to an exhaust gas evacuation device according to the preamble of patent claim 21. Advantageous refinements and developments of the invention are set out in the dependent patent claims and in the description with attached drawing.

10 It is advantageous to use a flexible line, e.g. a hose, a pipe or a tube, to connect the exhaust pipe of a motor vehicle to an exhaust gas evacuation device during driving in assembly areas, inspection areas, garages, parking areas for emergency vehicles, etc.

15 In exhaust gas evacuation lines, for example for emergency vehicles, a safety coupling of the abovementioned type is already known. When the vehicle sets out in the event of an alarm, said vehicle pulls the suction hose behind it until the vehicle is outside the garage, at which point the hose is automatically released from the vehicle's exhaust pipe. The same principle is applied at the premises of Svensk Bilprovning (Swedish Motor Vehicle Inspection). If, for example, the hose catches on something before the vehicle has reached the position where the hose is automatically released, or if there is a defect in the release mechanism, the tensile force in the suction hose may very quickly increase. When the force reaches a predetermined threshold value, the safety coupling divides and thus prevents personal injuries and also prevents damage to the suction hose or other equipment.

35 In a conventional safety coupling of the abovementioned type, which is made up of two coupling halves provided with flanges, the coupling halves are held together by a rubber sleeve surrounding the flanges. In this case, the function of the safety coupling is dependent on the design of the flanges and also on the material from

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which the sleeve is made, and also its design, when determining the value of the tensile force at which it is desirable that the coupling should divide. Thus, for a safety coupling made of a given material and with a given design, it is possible to obtain division of the coupling halves at just one predetermined value of the tensile force in the suction hose. However, depending on the environmental requirements or vehicle type, it can be advantageous to be able to vary the force of release of the safety coupling without having to produce a completely new coupling variant for this purpose.

A previously known exhaust gas evacuation device equipped with a slotted suction channel on which a carriage can be moved is already known from DE-A1 196 22 860. The carriage can be connected to the exhaust pipe of a motor vehicle via a suction hose and a clamping device. The clamping device can be opened by means of a Bowden cable leading to the carriage. To prevent damage in the part with the vehicle's exhaust pipe and to avoid personal injuries, the exhaust gas hose and the Bowden cable are each provided with a safety coupling which can be released when a force is exceeded which is greater than the preset force required to correctly open the clamping device. If the clamping device is not opened in the correct way, or if the Bowden cable or exhaust sleeve gets caught on the vehicle, the safety coupling comes into action. Both the exhaust gas hose and the Bowden cable are divided in two by the respective safety coupling. This entails a relatively complicated construction with consequent adjustment difficulties. Since the Bowden cable with its safety coupling is situated inside the exhaust gas hose, its function can additionally be compromised by fouling.

The object of the present invention is therefore to make available a device which can be adapted to

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different exhaust gas evacuation devices, vehicles and environmental requirements in a simpler, more reliable and more cost-effective way than before.

5 This is made possible with a safety coupling and an exhaust gas evacuation device according to the characterizing features of patent claims 1 and 21. Advantageous developments and refinements are set out in the description and in the dependent patent claims.

10

The embodiments of the invention are shown on the attached diagrammatic drawing only by way of example and are explained in greater detail in the description which follows. Fig. 1 shows a safety coupling according to the invention with the locking ring mounted and shown in a cutaway view, without the spring arrangement in its starting position, Fig. 2 shows the safety coupling from Fig. 1, but with the locking ring in its release position, Fig. 3 shows a partially cutaway plan view of the locking ring with its sections and the spring arrangement in the starting position and with the coupling halves removed, Fig. 4 shows the locking ring from Fig. 3 in its release position, and Fig. 5 shows a perspective view of the locking ring from Fig. 3 with protective covers mounted in sections.

Figures 1 and 2 show an embodiment of a safety coupling 2 for a flexible line (not shown), which safety coupling is designed as a tubular, two-part flange joint with a first coupling half 4, a second coupling half 6 and a resilient locking ring 8. The first coupling half has a flange portion provided with a straight flange 10, and the second coupling half has a flange portion provided with a conical flange 11, which flanges preferably have the same external diameter d_y . The conical flange 11 can assume cone angles α in a range of 30-60°. Tests have shown that a value of 45° is advantageous for ensuring a reliable function of the safety coupling.

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The coupling halves can be joined together via the flanges by means of the resilient locking ring 8 which has an internal shape complementing the flange portions of the coupling halves and thus provides a form-fit connection with the flanges 10, 11 when it is mounted on these. For this purpose, the locking ring 8 has spring-loaded parts in the form of ring segments 12 which are movable relative to one another and which are each equipped in the radial direction with a first limb or ring side 14 and a second limb or ring side 16 which have free outer edges and which, along their inner edges, are connected to one another by a web 18 which is arched outward in part. The inner shape of the locking ring complementing the flange portions of the coupling halves has been obtained by virtue of the fact that the profile of the web 18, by being arched outward, includes, together with the respective inner edge of each ring side 14, 16, inwardly directed first 20 and second 22 coupling members. The profile of the web 18 adjoining the inner edge of the first ring side 14 thus forms, together with the latter, the first coupling member 20, and, the profile of the web 18 adjoining the inner edge of the second ring side 16 thus forms, together with the latter, the second coupling member 22. The first coupling member preferably consists of a first annular bead 20, and the second coupling member preferably consists of a second annular bead 22. The first annular bead 20 has a straight edge 24 corresponding to the straight flange 10 of the first coupling half, while the second annular bead 22 has a beveled edge 26 corresponding to the conical flange 11 of the second coupling half.

Figure 3 shows a partially cutaway plan view of an embodiment of the resilient locking ring 8 in the starting position and with the coupling halves removed, and Fig. 4 shows the locking ring from Fig. 3 in the release position. The locking ring 8 can be made up of

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three or more ring segments which are preferably mutually identical. According to the embodiment shown, the locking ring has four identical ring segments 12, as this has been found to be advantageous both for the functional properties and for the production process. Each ring segment 12 shows in a cutaway view the previously described elements with reference numbers 14-26 and additionally has a first 28 and a second 30 radially extending end wall. The locking ring 8 also has a spring arrangement 32 with resilient elements, which arrangement is designed, with a prestressing force f , to press the ring segments together to a first position in which the locking ring has a surrounding internal diameter d_{i1} which is smaller than the external diameter d_y of the conical flange 11.

The spring arrangement 32 can comprise one or more resilient elements 34 which have an adjustment device 36 by means of which the prestressing force f can be adjusted. The resilient element can be made up of a rubber shock absorber, a helical spring designed as tension spring or compression spring 34 or the like, and the adjustment device advantageously comprises a tightening screw 38. The ring segments 12 are preferably joined together by virtue of the tightening screw 38 being arranged to run through the compression spring 34, the first end wall 28 and the second end wall 30 of adjoining ring segments, and by means of a nut 40 arranged on the tightening screw. Arranged on the inside of the first end wall 28 there is a sleeve 42 which accommodates the tightening screw 38 with the applied compression spring 34 which is tensioned between the first end wall 28 and a screw head 44 of the tightening screw.

The nut 40 which is arranged on the inside of the second end wall 30 is accommodated in a rotationally fixed manner in a recess 46 in which the flanks of the nut have a form-fit. The radially outer part 48 of the

sleeve is shortened, which means that it is easy to access the screw head for adjustments, while at the same time the position of the screw head 44 in the sleeve 42 is easy to determine, which facilitates a uniform prestressing of the respective adjustment device 36.

To protect the spring arrangement 32 of the safety coupling and also other equipment which may come into contact with the safety coupling 2, each segment 12 has a protective cover 50 of soft material, for example rubber or plastic, which can be snap-fitted onto the free outer edges of the ring sides 14, 16.

The safety coupling 2 has the following function. When the locking ring 8 is mounted on the flanges 10, 11 and its segments 12 are prestressed to the first position in which the surrounding diameter has a starting value d_{i1} , and the coupling halves 4, 6 are loaded with a tensile force F , the oblique edge of the conical flange 11 of the second coupling half 6 gives rise, because of a wedge effect, to radially acting force components (not shown). When the sum of these radial force components exceeds the combined force of the prestressed compression springs 34, the segments 12 will separate, which means that the surrounding diameter d_i increases from its starting value d_{i1} . If the tensile force increases to a predetermined value F_1 , the segments 12 will separate to a second position in which the surrounding diameter d_{i2} is equal to the diameter d_y of the second coupling half 6 across the flange, and the safety coupling divides. Since the first coupling half 4 has a straight flange 10 and the second coupling half 11 has a conical flange, the spring-loaded locking ring 8 will remain on the first coupling half when the coupling divides. It is therefore advantageous, for example in an exhaust gas evacuation device for motor vehicles, to connect the first coupling half 10 to the suction hose of the

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evacuation channel and the second coupling half to one end of a short suction hose, ca. 1 m in length, whose other end is connected to the clamping device which can be connected to the exhaust pipe of the motor vehicle.

5

In the present case, it can be advantageous to arrange a seal (not shown) made of suitable sealing material on the mutually adjoining ring surfaces of one or both flanges 10, 11 of the respective coupling half 4, 6.

10 Although the spring arrangement in the illustrated example has four adjustable resilient elements 34, the same can also consist of a single resilient element which is designed as a tension spring or rubber shock absorber which is tensioned about the circumference of
15 the locking ring 8. The segments 12 of the locking ring can be of any suitable hard plastic material, the coupling halves of pressed steel, and the spring elements of a conventional type.

20 By means of the invention it is thus possible to make available a safety coupling which releases in a reliable manner and which can be adjusted with simple tools, for example a screwdriver, to obtain the desired release force.

Patent Claims

1. A safety coupling (2) for a flexible line,
designed as a tubular, two-part flange joint with
5 a first coupling half (4) and a second coupling
half (6), which coupling halves have flange parts
each with a flange (10, 11) and are joined
together via the flanges by means of a resilient
locking ring (8), characterized in that the
10 flanges and the locking ring have at least one
mutual contact surface (11, 26) which is conical,
in that the locking ring has segments (12) which
are movable relative to one another and whose
radial cross sections are designed with inwardly
15 directed coupling members (20, 22) arranged at a
distance from one another, and which segments
(12), by means of the prestressing force (f) of a
spring arrangement (32), are each resiliently
prestressed to a first position in which the
20 coupling members (20, 22) straddle the flanges
(10, 11), and in that the flanges are separable by
means of the fact that, when a tensile force (F1)
acts on the coupling, the segments (12) of the
locking ring can be displaced by a wedge effect
25 counter to the prestressing force (f) to a second
position in which the surrounding internal
diameter (di) of the locking ring (8) corresponds
at least to the external diameter (dy) of one
flange and the coupling (2) divides.
30
2. The safety coupling as claimed in claim 1,
characterized in that the coupling (2) divides
when a predetermined tensile force (F1) on the
line is exceeded.
- 35 3. The safety coupling as claimed in claim 2,
characterized in that the magnitude of the
predetermined tensile force (F1) is dependent on
the magnitude of the prestressing force (f) of the

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spring arrangement (32) of the locking ring (8).

4. The safety coupling as claimed in claim 3,
characterized in that the spring arrangement (32)
5 of the locking ring has at least one resilient
element (34) which generates the prestressing
force (f).
5. The safety coupling as claimed in claim 4,
10 characterized in that the resilient element (34)
is equipped with an adjustment device (36) by
means of which the prestressing force (f) can be
adjusted.
- 15 6. The safety coupling as claimed in claim 4 or 5,
characterized in that the resilient element (34)
is a rubber shock absorber.
7. The safety coupling as claimed in claim 4 or 5,
20 characterized in that the resilient element (34)
is a tension spring.
8. The safety coupling as claimed in claim 4 or 5,
characterized in that the resilient element (34)
25 is a compression spring.
9. The safety coupling as claimed in any of claims 5
through 8, characterized in that the adjustment
device (36) has a tightening screw (38) for
30 adjusting the prestressing force.
10. The safety coupling as claimed in any of the
preceding claims, characterized in that both the
first and second coupling halves (4, 6) are
35 provided with a straight flange.
11. The safety coupling as claimed in any of claims 1
through 10, characterized in that both the first
and second coupling halves (4, 6) are provided

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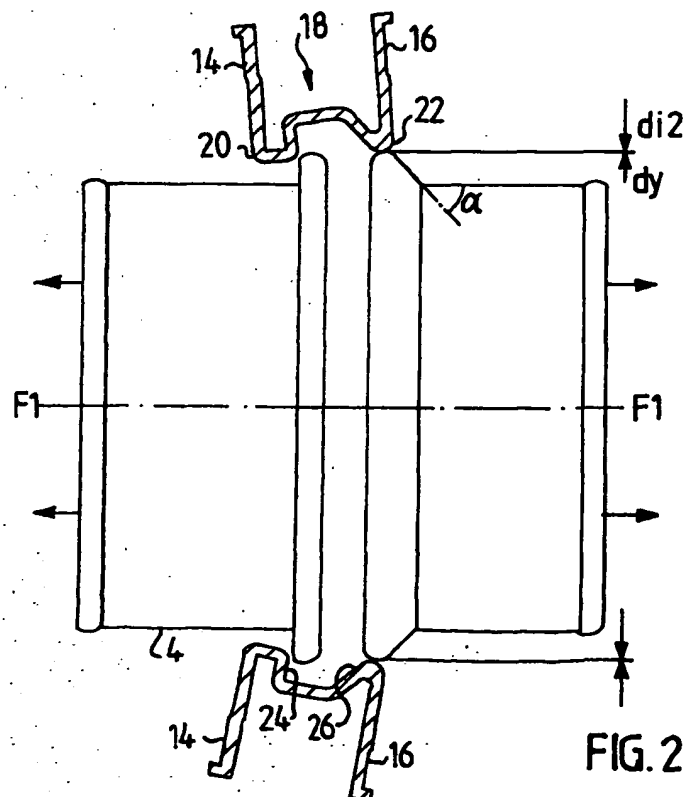
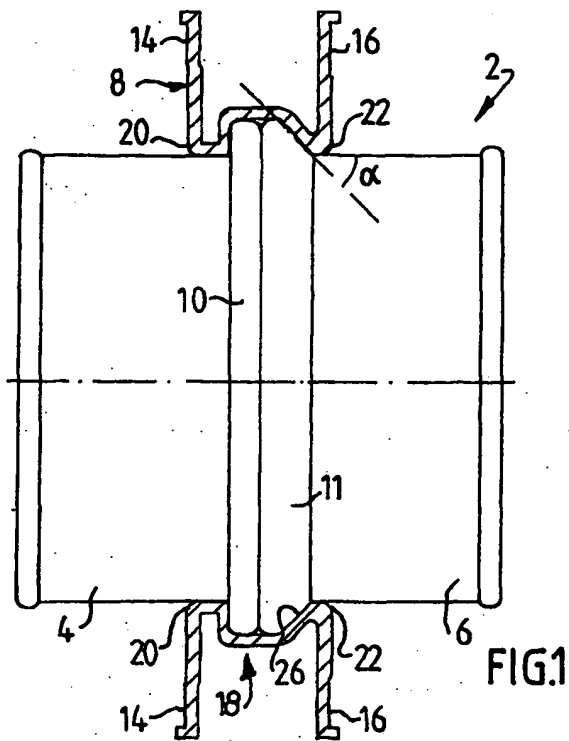
with a conical flange.

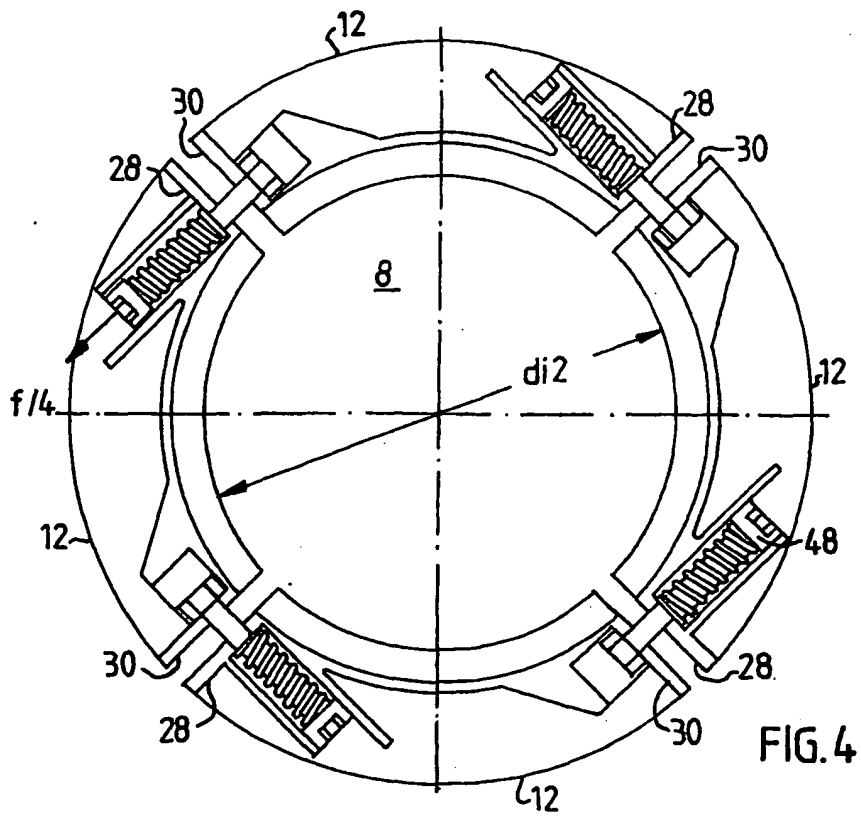
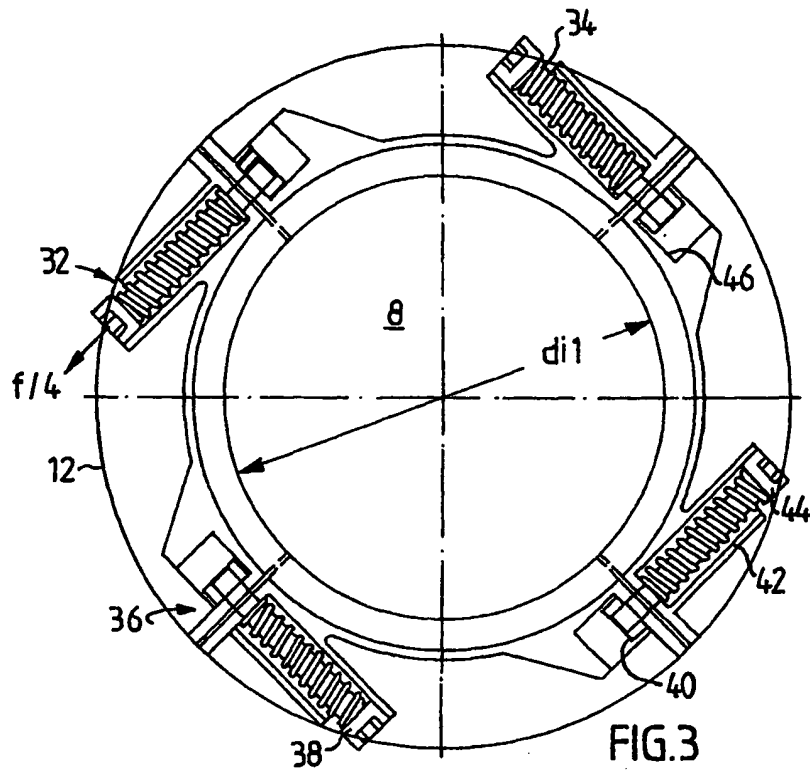
- 5 12. The safety coupling as claimed in any of claims 1 through 10, characterized in that the first coupling half (4) is provided with a straight flange (10) and the second coupling half (6) is provided with a conical flange (11).
- 10 13. The safety coupling as claimed in any of the preceding claims, characterized in that the locking ring (8) has a shape complementing the flange parts of the coupling halves (4, 6).
- 15 14. The safety coupling as claimed in any of the preceding claims, characterized in that the locking ring (8) has at least three mutually movable segments (12).
- 20 15. The safety coupling as claimed in claim 14, characterized in that the locking ring (8) has four mutually movable segments (12).
- 25 16. The safety coupling as claimed in any of claims 5 through 15, characterized in that the spring arrangement (32) comprises adjustable resilient elements (34) acting between adjoining ends of the mutually movable segments (12) of the locking ring (8).
- 30 17. The safety coupling as claimed in claim 16, characterized in that each resilient element (34) is arranged to act tangentially between two ring segments (12).
- 35 18. The safety coupling as claimed in any of the preceding claims, characterized in that when the segments (12) of the locking ring have assumed the first position, the coupling members (20, 22) straddle the flanges (10, 11) so as to bear in a

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form-fit against the flange parts of the coupling halves (4, 6).

- 5 19. The safety coupling as claimed in claim 18, characterized in that the coupling members consist of a first annular bead (20) with straight edge (24) and a second annular bead (22) with beveled edge (26).
- 10 20. The safety coupling as claimed in claim 19, characterized in that the annular beads (20, 22) are connected to one another by means of a web (18).
- 15 21. An exhaust gas evacuation device for motor vehicles, with an evacuation channel comprising a flexible line in the form of a suction hose which can be connected to the motor vehicle's exhaust pipe with the aid of a clamp arrangement which can
20 be maneuvered between an active position and an inactive position depending on the position of the motor vehicle relative to the evacuation channel, characterized in that the suction hose can be divided by means of a safety coupling (2) which
25 has the features set out in any of the preceding patent claims.





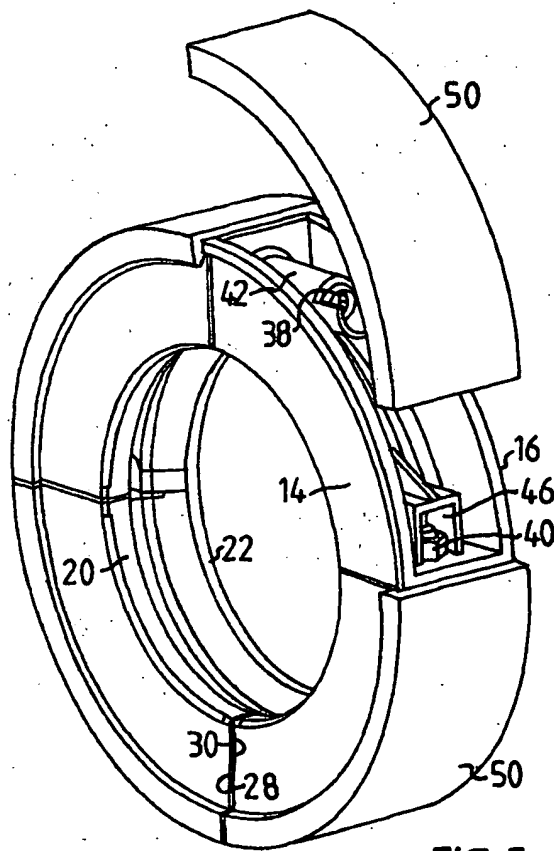


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/02560

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B08B 15/00, B60K 13/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B08B, B60K, F16J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5609298 A (W.J. HYSLOP), 11 March 1997 (11.03.97), column 11, figures 11-13 --	1-21
A	DE 19622860 A1 (NORFI EXHAUST EXTRACTION SYSTEM GMBH), 23 January 1997 (23.01.97), abstract, figures --	1-21
A	Patent Abstracts of Japan, abstract of JP 11-159626 A (MECS CORP), 15 June 1999 (15.06.99), the whole document --	1-21
A	US 5453048 A (L.C. ZIMA ET AL), 26 Sept 1995 (26.09.95), figures --	1-21

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of mailing of the international search report

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International application No.

PCT/SE 01/02560

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5679072 A (E.S. BRODIN ET AL), 21 October 1997 (21.10.97), abstract, figures</p> <p style="text-align: center;">---</p> <p style="text-align: center;">-----</p>	1-21

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/SE 01/02560

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	5609298	A	11/03/97	CA	2189308 A,C	04/05/97
DE	19622860	A1	23/01/97	DE	29511893 U	21/09/95
				IT	1284048 B	08/05/98
				IT	MI961259 A	22/12/97
US	5453048	A	26/09/95	CA	2147098 A	20/10/95
US	5679072	A	21/10/97	NONE		